Division of Biosciences

Department of Computational Biology and Medical Sciences

Laboratory	Faculty	Introduction of research activities and laboratory	Key words	Projects or activities summer program students can participate
Morishita Laboratory	Dr. Shinichi MORISHITA	We have been attempting to develop efficient and accurate algorithms for uncovering "dark matters" in genomes that are hard to observe using traditional second generation DNA sequencers such as Illumina HiSeq and Ion torrent. Typical examples of dark matters are genomic sequences of long repetitive elements (LINE and LTR), centromeres, telomeres, homologous chromosomes, and microbiome. Towards this end, we exploit full potential of our third generation sequencers (PacBio Sequel, Oxford nanopore, 10X Chromium) that realize single-molecule sequencing and are capable of sequencing very long DNA fragments of >10,000 base pairs. Extending single-molecule sequencing, we also have been devising efficient algorithms for observing DNA methylation states of dark matters, for example, CpG methylation of centromeric repeats and highly repetitive transposons, and 6mA in gut microbiome so as to understand their biological functions.	single-molecule sequencing, single-cell sequencing, centromeres, microbiome, DNA methylation	We introduce basic ideas and algorithms for handling single-molecule sequencing data as well as how to operate third generation sequencers. We also provide a couple of open problems in this research fields. Afterwards, summer students are expected to propose and develop new ideas, applications, or algorithms through brainstorming with our graduate and undergraduate students. They can use highly parallel computers with thousands of CPU cores if they are interested.